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ABSTRACT

The combined effects of orienting activities and levels of practice on learning from interactive video were examined in this study. The 72 college students who participated in the study were randomly assigned to either a group that received an orienting activity (i.e., a brief statement designed to prepare learners for the information to come) or one that did not. Students were further assigned to one of three practice groups: (1) no practice, (2) limited practice, or (3) elaborate practice. An interactive video lesson focusing on the characteristics of various artists and art periods was then presented. The lesson included interaction in the form of criterion-based practice for half of the facts and applications cued initially via the orienting activity. Posttest results indicated significant effects in favor of embedded practice versus no practice; however, no significant difference was found between limited and elaborate practice, and no effects involving orienting activities were found. Areas for further research are suggested. One table and two figures display the study results and 36 references are provided. (Author/MES)

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THE EFFECTS OF PRACTICE AND ORIENTING ACTIVITIES ON LEARNING FROM INTERACTIVE VIDEO

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ABSTRACT

The purpose of this study was to examine the combined effects of orienting activities and levels of practice on learning from interactive video. Participants were 72 college students. Each participant was randomly assigned to either a group that received an orienting activity or one that did not. Students were further assigned to one of three practice groups: No Practice, Limited Practice, or Elaborate Practice. An interactive video lesson, focusing on characteristics of various artists and art periods, was then presented. The lesson included interaction in the form of criterion-based practice for one-half of the facts and applications cued initially via the orienting activity. Results indicated significant effects in favor of embedded practice versus no practice. Results also indicated that there were no significant differences between limited practice and elaborate practice for recall of lesson information.

THE EFFECTS OF LEVELS OF PRACTICE AND ORIENTING ACTIVITIES ON LEARNING FROM INTERACTIVE VIDEO

The application of interactive video as an instructional medium has been the focus of growing interest during the past few years (Brawley & Peterson, 1983). Until recently, however, empirical research on the effects of interactive video has been sparse (Hannafin, 1985; Hannafin, Garhart, Rieber, & Phillips, 1985).

One current area of interest in the design of interactive video is the effect of orienting activities on learning (Hannafin & Phillips, 1986). Orienting activities are mediators through which subsequent instruction can be presented (Hannafin & Hughes, 1986). Results of studies on the effects of orienting activities during interactive video indicate that both the amount and type of learning can be effected. However, the effectiveness of orienting activities tends to be inversely related to lesson organization (Ausubel, 1978; Mayer, 1979). The power of orienting activities increases as the availability of alternative processing aids, such as practice, decreases.

Practice, another area of interest in the design of computer-based instruction (CBE), in certain learning situations, has been found to be an effective aid to learner processing (Salisbury, Richards, & Klein, 1985). One common form of practice is the use of embedded questions. Adjunct questions, depending in part on the specificity of the query, influence what is learned (Wager & Wager, 1985; Hamaker, 1986). Factually explicit questions, for example, typically require the learner to recall or recognize information exactly as presented during the lesson. This type of question may improve the learning of factual information but limit the learning of high level information (Clark, 1984). Higher order questions require the learner to reformulate material previously presented with new information (Andre, 1979), and have often been found to have a postive effect on the learning of factual information.

The type of feedback provided during practice can also effect learning. Elaborate forms of feedback, those providing detailed information related to student responses, have proven effective during interactive video. Schaffer and Hannafin (1986), for example, employed progressively elaborate forms of feedback to learners during an interactive video lesson and reported increased overall learning but reduced efficiency. However, increases in the complexity of feedback do not always increase learning. Rather, in certain situations, less elaborate forms of feedback have been found to be most effective (Kulhavy, White, Top, Chan, & Adams, 1985).

Recent research has suggested that the effectiveness of learning variables, such as embedded orienting activities and learning strategies, are often subsumed by en-route practice. However, practice has often been treated as a within-subject factor, potentially confounding the effects of the remaining variables. The purpose of this study was to examine the effect of varied levels of practice and orienting activities on the learning of facts and applications. Unlike earlier research, practice was treated as a between-subjects factor in the present study.

METHODS

Subjects

Subjects consisted of 72 volunteer undergraduate students enrolled in an introductory educational psychology course. Students received extra credit for participation in the study.

Materials

Lesson Content.

The lesson content was adapted from a portion of the National Gallery of Art videodisc entitled "Tour of the National Gallery of Art". It presented information about artistic styles, individual artists, and the effects of historical events on the artistic periods. Each artistic period is explained and the characteristics and famous artists of the era are highlighted.

The lesson was designed to present factual information and to teach participants to apply the knowledge. Factual information included names of artists, geographic locations, social and political factors effecting the art of a period, and the names of the different artistic eras. On the other hand, applications included the characteristics of the paintings of individual artists and each of the artistic eras. This knowledge could then be applied to classify various works according to artist or era.

Instructional Segments.

The lesson consisted of eight video segments, which covered chronologically the artistic periods from the late 13th century to the 20th century. Information in each segment dealt with social and political influences, noteworthy artists, and characteristics or style of the art of that period. Each of the segments was roughly 3-5 minutes in length and contained approximately the same amount of information. All participants received the same information in the same sequence: an orienting activity, information presentation, practice, and feedback. The lesson required approximately 50 minutes to complete.

Orienting Activity.

Prior to each instructional segment, one-half of the subjects were presented with an orienting activity. The orienting activity included a brief statement designed to assist learners to prepare for the information to come, prior to each instructional segment. An example of an orienting activity was: "In this section, pay attention to information concerning the dominating influences that affected art in the 14th century." The remaining subjects did not receive an orienting activity. Instead, these participants were given the following information prior to the instructional segment: "Use whatever way you remember and learn most effectively to prepare for the next section." All subjects were given 10 seconds to process the orienting activity prior to beginning the instructional segment.

Practice Questions and Feedback.

Practice was provided as an opportunity to answer questions related to the information presented. Two types of questions, factual and application, were utilized. Factual questions dealt with the declarative,historical information about artists, countries, and political factors. Application questions provided practice in identifying characteristics of artists or the art of a period. During application questions, students were presented previously unseen paintings and asked to identify the period in which it was painted (or the artist) based upon the characteristics of the painting.

Three levels of practice were utilized in this study: Elaborate Practice, Limited Practice, and No Practice.

Elaborate Practice. Subjects in the elaborate practice group received two multiple choice questions (1 fact, 1 application) after each of the eight instructional segments. Following each of the questions, students received appropriate feedback based upon the correctness of their answer (e.g., "Very Good, that was correct"; "Sorry, that's not right"). Students who initially answered incorrectly were told to pay closer attention as a relevant portion of the video was replayed. If answered incorrectly on the second attempt the correct answer was provided and the lesson continued.

Limited Practice. Subjects in the limited practice group received the same two multiple choice questions (1 fact, 1 application) following each of the eight instructional segments. Following each of the questions, students received appropriate feedback based upon the correctness of their answer. Students answering incorrectly were provided with the correct answer to the question before the lesson continued.

No Practice. The lesson presented to this group contained no embedded questions, but contained the same lesson sequence and flow as the other levels.

Lesson Posttest.

The posttest consisted of 32 five-part multiple choice questions: 16 questions (8 fact, 8 application) were repeated from the embedded portion of the test; the remaining 16 questions (8 fact, 8 application) were parallel in nature and equivalent in difficulty but not previously practiced. All questions tested information presented in the lesson. Reliability of the overall posttest was also computed (alpha = .77).

Design and Data Analysis

The study employed a 2x3 between subject design with two additional completely crossed within-subjects factors. The between subjects factors were Orienting Activity (Activity, No Activity) and Level of Practice(Elaborate Practice, Limited Practice, and No Practice). The within subject factors were Type of Learning (Facts and Applications) and Question Familiarity (New, Repeated). MANOVA procedures were used to analyze overall effects, with follow-up ANOVA procedures to test for univariate effects.

Procedures

Subjects were randomly assigned to one of the six groups. Prior to beginning the study, a brief orientation to the equipment and the nature of the study was provided. The instructional portion of the treatment and the posttest were administered consecutively during

the session in accordance with treatment group assignments. All subjects were administered the lesson in noise-proof cubicles which were reserved for this study. Participants were provided with general information regarding their performance upon completion of the posttest.

RESULTS AND DISCUSSION

The mean number of correct responses for each posttest subscale were computed for each student. Since no effects involving orienting activities were found, the means and standard deviations, collapsed across Orienting Activities, are shown on Table 1. As expected, significant overall effects were found for Practice, $F(2,66) = 25.60$, $p<.0001$. As indicated by the interaction between Practice and Type of Learning, the effects of practice were the same for both Facts and Applications, but proportionally greater for Facts, $F(2,66) = 4.45$, $p = .015$. This interaction is illustrated in Figure 1. There was virtually no difference between the Fact and Application mean scores for the No Practice group (8.37 vs. 7.79). Limited Practice and Elaborate Practice were comparable in the effect on Facts (12.63 vs. 12.58), but Elaborate Practice was slightly more effective for the learning of Applications.

Insert Table 1 and Figure 1 About Here

Significant effects were also found for Test Item Familiarity, $F(1,66) = 146.58$, $p<.0001$, and for the interaction between Practice and Item Familiarity, $F(2,66) = 35.67$, $p<.0001$. As expected, repeated items were recalled at a much higher rate than new items (11.92 vs. 8.77). The No Practice group performed comparably on repeated and new items (8.12 vs. 8.04), since no opportunity for item practice was provided during the lesson. However, the comparable difficulty of repeated and new items was established. For the Limited and Elaborate Practice groups, however, repeated items were recalled at a significantly higher rate than new items, as illustrated in Figure 2. It was hypothesized that greater "spread of activation" might be expected to non-questioned lesson context --especially via the higher level application questions. This effect, however, was not detected.

The effects of orienting activities were not significant. In fact, orienting activities were found to exert almost no measurable differences in their effect on learning, with less than one raw score point difference between the No Orienting Activities and Orienting Activities groups across practice. This pattern was also evident when orienting effects were examined in conjunction with practice: virtually no measurable effects were observed.

Insert Figure 2 About Here

GENERAL DISCUSSION

The purpose of this study was to examine the effects of levels of practice and orienting activities on learning from interactive video. Consistent with previous research, practice appears to dominate the instructional effectiveness of interactive video even though the

potential for widely varied presentation strategies are available. Inconsistent with the prior research, integrative questioning techniques, in the form of application questions, had little carry-over to non-practiced lesson content.

Students receiving practice, in the form of questions, outperformed groups that did not. This was expected and consistent with prior research on practice involving questions (Schloss, Sindelar, Cartwright, & Schloss, 1986). However, there were no significant differences between groups receiving limited practice and elaborate practice. This is consistent with feedback reseach performed by Kulhavy et al (1985), who reported that when increasingly complex levels of feedback are presented, the amount of learning time required increases but learner performance does not. This suggests that in many learning situations, providing the learner with simple response feedback is often as effective as elaborate practice.

The interaction between practice and type of learning revealed that both limited and elaborate practice treatments were superior to no practice, but the effect was most pronounced for facts versus applications. This is consistent with recent findings for both computer-based instruction (Hannafin, Phillips, Rieber, & Garhart, 1985) and interactive video (Hannafin, Phillips, & Tripp, 1986), suggesting that the benefits of embedded practice are greatest for the learning of simple declarative knowledge. Other types of learning, such as application learning in the present study, seem less sensitive to criterion-based questioning as a practice strategy.

Students were far more likely to respond correctly to repeated questions, those practiced during the instruction, than to new questions. This effect was expected and is consistent with the tenents of mastery-based instruction (Bloom, 1976). Some have suggested that the most reliable method for confirming learning is through the presentation of criterion questions, production of responses, provision of relevant feedback, and re-instruction of skills not demonstrated. Redundancy of exposure alone provides a plausible explanation, although such effects can be easily reconciled via a variety of learning theory paradigms. The present findings lend support for the importance of practice-test item redundancy for all criterion concepts, though the practicality of the process is questionable.

The effect of practice was limited to the specific questioned information and applications. While this was expected for factual items, which tend to limit the acquisition of non-questioned information, greater generalization was predicted for application items. Prior research has suggested that high level questions tend to increase the spread of activation by promoting the learning of both the specific questioned information and additional information presented in the lesson (Hamaker, 1986). This was thought to be especially true when the elaborate practice capabilities of interactive video, featuring review of critical visual elements associated with the task were provided(cf. Hannafin & Colamaio, 1986). However, contrary to those findings, the results of this study indicate very little spread of activation.

The absence of effects associated with orienting activities provides further evidence of the limited power of such techniques when used in combination with other instructional variables. In this study, practice, item familiarity, and type of learning collectively accounted for nearly 60% of the total score variance, while orienting activities, including both main effect and associated interactions, accounted for less than 3% of the score variance. This appears to be consistent with the results of prior research that indicated that the effectiveness of orienting activities tends to be inversely related to the degree to which other instructional variables are utilized in the lesson. Perhaps cognitive orienting tasks provide benefits not readily detectable in short-term, single topic studies by encouraging deeper levels of processing. If so, the short-term nature of the present study would minimize the chances of

detecting the effect. However, compelling evidence has been reported to suggest other, more powerful instructional variables simply subsume the orienting activity effects.

Though practice in this study was defined as the presentation of criterion questions, numerous, and potentially more powerful, practice techniques have also been proposed (Salisbury, Richard, & Klein, 1985). Practice methods that promote the building of associations, the generation of meaning, and emphasis on transfer require study. In addition, though no differences were found between the two practice groups, this may have been an artifact of the content selected for the study. There is a need for research focusing on progressively elaborate forms of feedback for tasks with strong visual or aural requirements. Finally, efforts to extend the localized versus generalized effects of various embedded questioning techniques should be advanced.

The purpose of this study was to examine the effects of orienting activities and varied levels of practice on learning from interactive video. Some of the effects suggested interesting and practical implications for both future research and practice. Additional study should help to refine the methods used in the design of interactive video.

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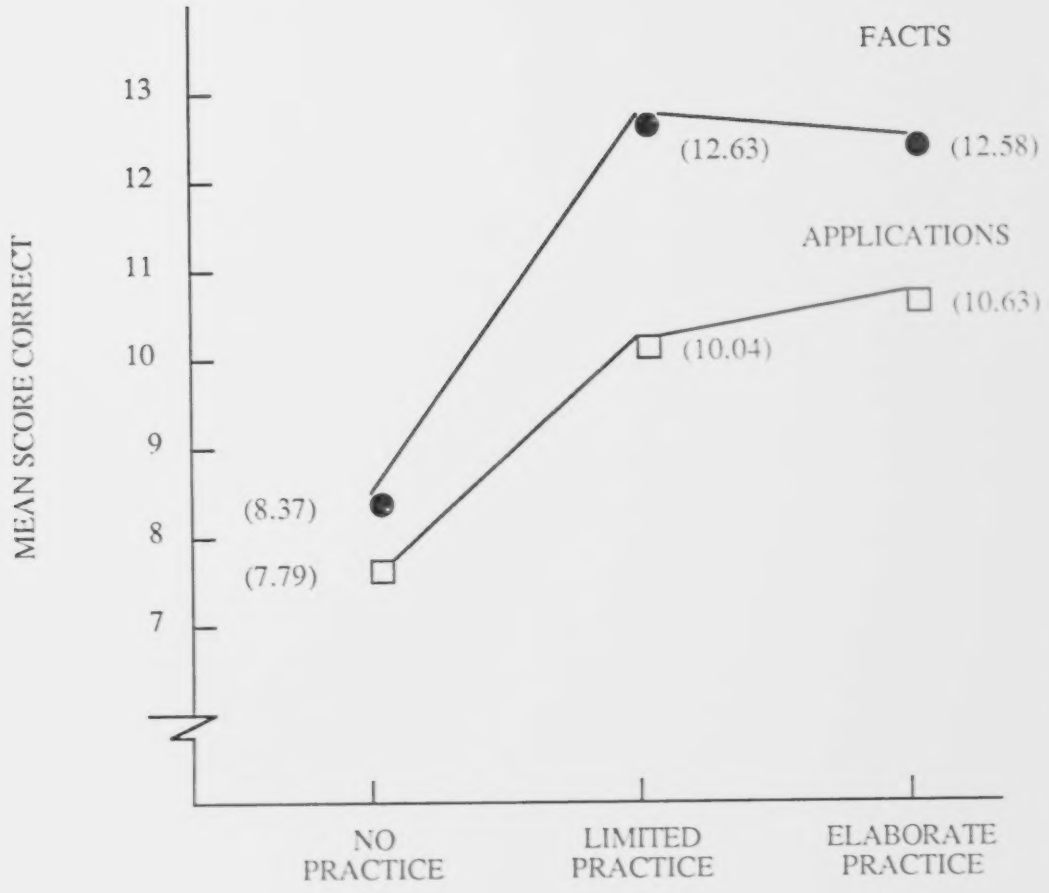
Means and Standard Deviations for Fact and Applications Posttest Questions

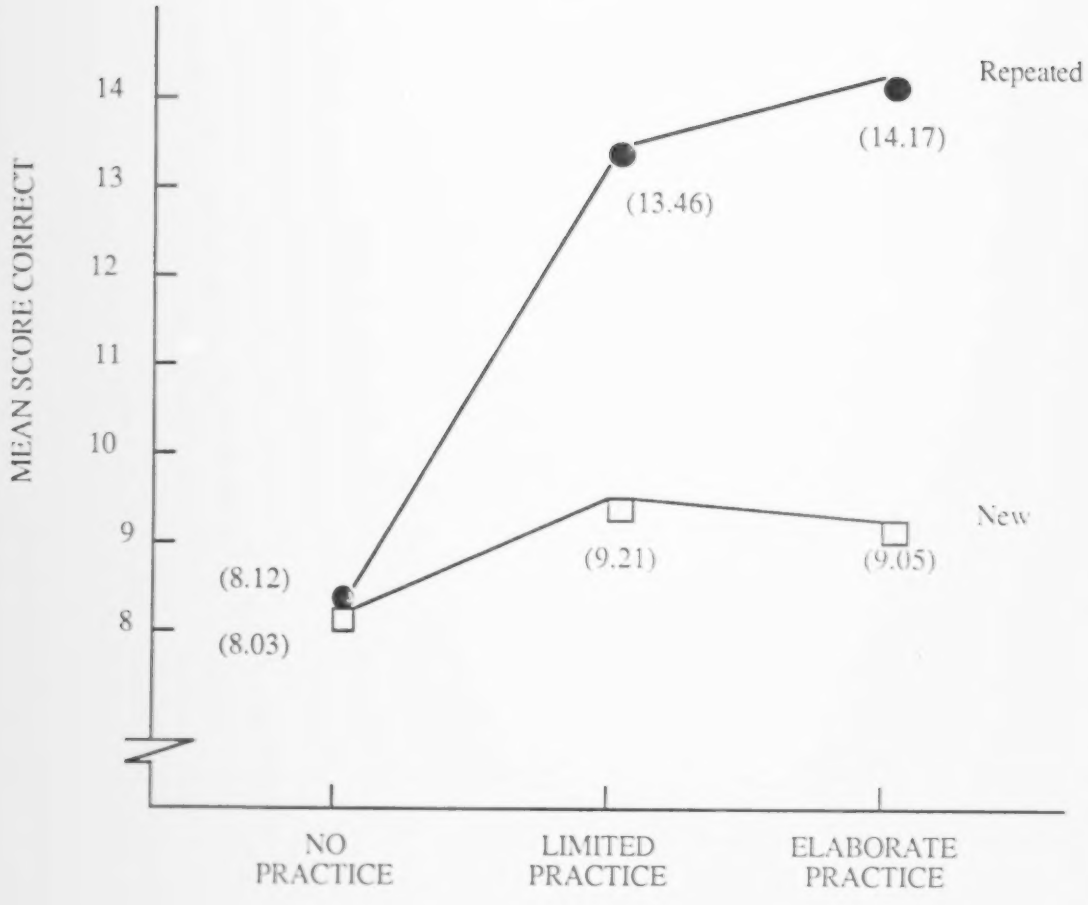
PRACTICE		REPEATED			NEW			TOTALS	
		Facts	Applications	Total	Facts	Applications	Total	Facts	Applications
None	Mean	4.04	4.08	8.12	4.33	3.71	8.04	8.37	7.79
	(SD)	1.39	1.64		1.46	1.26		2.52	2.45
Limited	Mean	7.13	6.33	13.46	5.50	3.71	9.21	12.63	10.04
	(SD)	.89	1.68		1.53	1.16		1.86	2.27
Elaborate	Mean	7.46	6.71	14.17	5.13	3.92	9.05	12.58	10.63
	(SD)	.65	1.23		1.56	1.41		1.79	2.34
	Mean	6.21	5.71	11.92	4.99	3.78	8.77	11.19	9.49
	(SD)	1.85	1.90		1.57	1.26		2.87	2.60

Note: n for each subject treatment combination = 12; total N=72



Interaction Between Level of Practice and Type of Learning

FIGURE 1



The Effects of Practice on New and Repeated Questions

FIGURE 2